University of Florida

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MAP4305/5304 Intermediate Differential equations: Syllabus

Textbook

Fundamentals of Differential Equations and Boundary Value Problems, 7th Edition, by R. K. Nagle, E. B. Saff, and A. D. Snider

Course Content

Topic 1: Review. Complex numbers. Functions of complex variables. Differential operators. Linear differential equations and linear systems of them. The elimination method (Sections 6.2; 5.2)

Topic 2: Matrix methods for systems of linear differential equations (Chapter 9). Linear systems in a normal form (Section 9.4). Homogeneous linear systems (Sections 9.5, 9.6). Non-homogeneous linear systems (Section 9.7). The matrix exponential function (Section 9.8)

Topic 3: Special functions (Chapter 8). Review: Power series solutions to linear differential equations (Sections 8.3, 8.4). The method of Frobenius (Sections 8.6, 8.7). Hypergeometric, Bessel, and Legendre equations (Section 8.8)

Topic 4: Sturm-Liouville boundary value problems (Chapter 11). Eigenvalue and boundary value problems for differential operators. Regular Sturm-Liuoville boundary value problems (Section 11.3). Non-homogeneous boundary value problem. Fredholm alternative (Section 11.4). Green's functions of differential operators (Section 11.6). Singular Sturm-Liouville boundary value problems (Section 11.7). Complete orthogonal sets functions and eigenvalue problems for Sturm-Liouville operators.

Topic 5: Either Chapter 10 (elements of partial differential equations) or Chapter 12 (Stability of autonomous systems). Only if time permits. The choice of a topic is up to the class and to be discussed toward the end of the course (e.g., during the 5th week)

Prerequisites

Calculus 1, 2, and 3; MAP 2302; MAS 3114 (or MAS 4105). A poor knowledge of prerequisite will not be tolerated. If you took prerequisite courses long time ago, you might consider reviewing (or auditing) them before taking this course. Programming skills are not required.

Course page

All materials for the course, announcements, tests, and links to video office hours will be posted in the **course page** under **"Lectures and Homework"**

Video lectures

The first class meeting will start with a Zoom meeting to discuss the basic rules of the course. It starts according to the official course schedule. You should get notified via Canvas. All lectures are prerecorded video lectures. They will be posted in the course page. You should view them regularly. It is strongly recommended that you repeat all examples discussed in lectures with pen and paper. For each lecture there will be some additional recommended reading in the textbook, which is also helpful for doing homework and tests. The course goes FAST. Watching lectures only at the end of the week before the test will, most likely, result in failing the course.

Homework

A homework will be assigned for every lecture. The video lectures and all assignments for them will posted in the course page. The homework is not turned in. However, all tests will contain problems similar to homework problems. It is therefore crucial to do homework regularly in order to attain a good grade. The homework problems are taken from the course textbook. Make sure that you have the edition indicated above.

Video office hours

Q&A sessions will be conducted via Zoom. The links to all Zoom meetings will be posted in the Canvas shell of the course.

Testing

There will be a test every week, 6 total. The tests will be conducted via Canvas every Monday, 6-9 pm, except possibly the last one (final). Each assignment contains 3-6 problems from the topics discussed during the most recent week. All tests are free-response. You will have 2-3 hours to complete and scan your work, and upload it as a single PDF file via Canvas. Make sure that you have tools to do so. Here are some useful Apps: CamScanner, Adobe Scan, Scanbot, Microsoft Office Lens, Evernote Scannable, Google Drive, TapScanner, PhotoScan, TurboScan among others. Late submissions will NOT be accepted. No make up for a missed test, unless there is a medical excuse signed by a hospital representative or a doctor. The excuse must contain a phone number of the medical facility issued it.

Student honor code:

Zero tolerance to any kind of cheating, **especially copying solutions from your class mates or letting your classmates to copy from you**. When caught cheating, the course grade is an F, no exception. If I have reasons to suspect "copying or letting to copy" (e.g., identical solutions with the same technical errors) all involved students will be subject to an individual video interview. If one of the involved students does not show the needed knowledge to solve the test problem or similar to it, all involved students will get no credit for the whole test. A second offense of this type may result into a failing grade in the course. I will NOT investigate who solved the problem and who copied it. So, to avoid such unfortunate events, make sure that you do not

discuss the test problems with anyone and do not show your work to anyone before the submission deadline. I also reserve a right to video interview any student to verify if solutions to test problems were obtained without any help from a third party. When submitting each test, you must sign the student honor pledge (provided with the exam sheet). Tests without the signed pledge will NOT be accepted.

Grading

Each test is scored by a fraction m/n where n is the number of problems in the test, and m is the number of problems solved correctly. The course score is calculated by dividing the sum of all m's by the sum of all n's and multiplying the result by 100:

G=100 (M/N), M=m1+m2+m3+m4+m5+m6, N=n1+n2+n3+n4+n5+n6

You will get partial credit for solving a problem if only minor technical errors occurred (e.g., 0.75 instead of 1.00). The following grade thresholds will be used:

A: G>90; A-: G>85; B+: G>80; B: G>75; B-: G>70; C+: G>65; C: G>60; C-: G>55; D+: G>50; D: G>45; D-: G>40; E: G<40